

## Personal Essay

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Implicit in my role as teacher and administrator is the need to know more than to do. My present position, as President of The Rockefeller University, requires a broad knowledge of my scientific colleagues' work in many fields. Many of my colleagues go to meetings to listen to presentations, but I prefer to read because I can better direct my attention than if I am at the mercy of the speaker.

Although my main responsibilities are looking for connections between things rather than being a completely informed specialist in any one subject, I use some pretty straightforward techniques of acquiring new knowledge. I scan 50 to 60 articles in *The New England Journal of Medicine*, *Science*, and *Nature*, and I use a weekly reporting service, the Automatic Subject Citation Alert (ASCA), which includes any article that cites the authors with whom I have been principally engaged in my scientific career. Research that cites any of about three dozen other authors is likely to be among my central interests. In addition, I receive weekly printouts of the titles of published articles by all The Rockefeller University authors. I request reprints or photocopies of 20 to 25 articles a week.

For the past fifteen years, I have been drawn increasingly into national security, international relations, and related political and economic affairs. Much of my reading is in periodicals like *Foreign Affairs*, *International Security*, *Foreign Policy*, and innumerable reports from the government, RAND, and other organizations. Most of the books I read are in these fields, as well as in biography and history. The articles in the two dozen series of *Annual Reviews* (whose Board of Directors I chair) are an invaluable grounding across the whole range of natural and social sciences.

I have the titles of useful articles recorded in roughly chronological order, and I keep a computer-searchable file of those I have read. After I look at the articles, they go into a box. Every once in a while, they are organized by date, just to have a systematic way of keeping them some-

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notes with information and ideas highly pertinent to our own interest based on his monitoring of research literature. He is unfailingly helpful to his students, friends and colleagues. Joshua Lederberg is always keenly aware of moving frontiers and is constantly searching for ways to improve the constructive uses of existing knowledge.

*David A. Hamburg, M.D.*

where without going to the enormous effort of maintaining a complex system. I keep subject files of reprints on 50 or so topics.

For five years I wrote a newspaper column and needed background material. I now keep paper files and computer entry items—anything from clippings to articles, with my own comments on them—several hundred rubrics.

I do not ordinarily keep both chronologic and subject files on the same material. The material filed chronologically is more diverse, and I am most likely to want something from it if it is within the past year than if it is ten years old. I make a point of discarding paper to avoid being burdened with the idea that I ought to go look for it. It is probably more cost-effective to go back to the library routinely. The only material I make sure I keep is what would not be available at the library or that is for some special personal purpose, like the interconnection of parts of science.

When I approach a problem, I usually immerse myself in it. I find out everything I can that might have some possible bearing on it. I try to identify with whatever phenomenon I am looking at, to put myself in the place of that animal, molecule, bug, organ, or whatever is being described. What does the world look like from that vantage point? A lot of it is subconscious. Without consciously trying to find solutions, I can go to bed at night and wake up in the morning, and there will be some random conjunction or ideas—sometimes elusive and dream-like—that can provide a different angle. I hasten to write it down before it torments me like a lost dream. The most difficult thing is to drop other preoccupations and concentrate on a given issue: the process of preparation may take precious hours.

Curiosity and motivation are essential in continuing education. I've been so curious all my life that I must discipline myself to suppress my curiosity in other directions to accomplish tasks I have agreed to do. Unfortunately, some people were not allowed to express their curiosity early in life, or it was not reinforced.

It is difficult to capture the elements leading to creative development. My own interest in science started at a very early age. My mother saved a piece I had written when I was seven, in which I expressed my determination to be a scientist. My parents responded with partial encouragement and partial dismay; the encouragement was positive and the dismay was challenging. By the time I was eleven or twelve, I was reading college textbooks in chemistry and mathematics. I do not see many youngsters today showing such intensity. I cannot explain my intensity at that age. At a certain point I was reinforced. My parents were proud of me; I did well at school; and my teachers were wise enough to leave me alone. In a classroom in which I was three or five years ahead of the rest, the other students did not pester me, and I did not pester them. I was very much self-taught, working by my own devices.

It was not until I got to college that I found someone willing to provide some kind of structure to my education. That was my mentor, Francis Ryan, at Columbia. It was in his laboratory that I learned about genetics and microbiology, out of which came my early research work. Ryan knew when to be tough and when and how to encourage me. He was a worthy debater, and I had not had many opportunities to argue logically up to that time. He was also a superb teacher—in his communicative skills and in his ability to identify with students—and he was able to draw out my ideas without competing with me. His style was to provide every encouragement for me to deal with a set of problems.

To encourage intellectual interaction here at The Rockefeller University, I organize a luncheon every couple of weeks with some of my colleagues, and I make a point of getting people together who would not ordinarily come together. From time to time, I exchange notes with others about scientific issues. It keeps me alive intellectually. I browse more than anyone else I know—because it is part of my job—and when I see material in an out-of-the-way place that one of my colleagues in a given specialty is unlikely to know about, I send him a copy. If it is helpful one time out of twenty, it is worth it.

Physicians can discuss their cases with their colleagues. Formal, mandatory continuing medical education, on the other hand, may get in the way of one's self-education. Psychiatry, for example, has been advancing relatively slowly: it is hard to distinguish psychiatry decade by decade except for the pharmacological advances. On the other hand, psychiatrists learn from experience and from their patients. So there may be a different need for continuing medical education in that field. The greatest gaps are more likely to be in the broad sphere of medicine than in one's own specialty. Yet the internist does need to know what is going on in surgery, pathology, and other specialties.